PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

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PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IB2004/000276	03.02.2004	

International Patent Classification (IPC) or both national classification and IPC
H01J47/06

Applicant
DICK, Louis

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ in written format

   ☐ in computer readable form

   c. time of filing/furnishing:

   ☐ contained in the international application as filed.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	4, 6-12
	No:	Claims	1, 2, 3, 5, 13
Inventive step (IS)	Yes:	Claims	4, 10, 11
	No:	Claims	1-3, 6-9, 12, 13
Industrial applicability (IA)	Yes:	Claims	1-13
	No:	Claims	

2. Citations and explanations

see separate sheet

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability

1. Reference is made to the following documents:

   D1: J. Veloso et al., 'A proposed new microstructure for gas radiation detectors: The microhole and strip plate', Review of Scientific Instruments, vol. 71, nr. 6, June 2000

   D2: J. Veloso et al., 'The microhole and strip plate gas detector: Initial results', Review of Scientific Instruments, vol. 73, nr. 2, February 2002

   D3: R. Bellazzini et al., 'The micro-groove detector', Nuclear Instruments and Methods A, vol. 424, nr. 2-3, 21 March 1999

   D4: S. Keller et al., 'Sparks in MSGC's', Nuclear Instruments and Methods A, vol. 419, nr. 2-3, 21 December 1998

   D5: B. Adeva et al., 'Performance of the Microwire Detector', Nuclear Instruments and Methods A, vol. 461, nr. 1-3, 1 April 2001

2. The characterising portion of independent claim 1 is construed as meaning merely that a matrix of electric field condensing areas and a signal detector are combined or integrated together (*united*) in a structure. The attribute "*physical*" merely limits the scope of the claim to structures having a material existence and thus being perceptible especially through the senses and subject to the laws of nature.

   Consequently, a detector comprising such a matrix of electric field condensing areas and a signal detector united, for instance, in a common housing or the like also falls within the scope of claim 1 as it is understood. Thus, the subject-matter of claim 1 does not differ most of the various types of gaseous radiation detectors known in the prior art, some particular relevant examples being discussed in the following.

3. Documents D1 and D2 disclose a gas radiation detector having a microhole and strip plate structure (MHSP) which merges the structures and characteristics of a gas electron multiplier (GEM) and a microstrip plate (MSP) in one single plate (cf. D1: abstract; paragraph 'I. Introduction'). The detector comprises a polymer film metal coated on both sides with a matrix of holes etched through the film and a standard microstrip pattern etched on one side (cf. Fig. 1: microstrip side).

Document D2 reports on operating the MHSP as a gas proportional counter (cf. figure 2). Variable bias voltages are established between the detector entrance window and the slotted front surface of the MHSP, $-V_{d1}$, between this surface and the cathode strips, $-V_{hole}$, between the cathode and anode strips of the microstrip structure, $-V_{ac}$, and also between the anodes and a backplane of the detector, V_{d2}. The entrance window is thus biased negatively with respect to the MHSP, acting as a drift electrode (cf. page 488, left column - page 489, left column).

Electrons coming from the drift region above the grid side will thus be focused toward the matrix of holes crossing the MHSP. The electric field inside the holes is high enough to allow charge multiplication. With a suitable potential difference $-V_{ac}$ applied between the cathode and anode strips, the electrons emerging from the holes are deflected toward the anodes where a second multiplication occurs. The charge is then collected by the anodes thus acting as a read-out electrodes.
Where position information is needed the grid electrode of the MHSP can be structured to have the second position coordinate, as depicted in figure 2 of document D1 (cf. paragraph 'II. Description and Applications').

Hence, both the GEM structure with the matrix of electric field condensing areas and the anodes as read-out electrodes of the signal detector are combined in a single structure which thus acts as an amplifier for primary electrons as well as a position-sensitive signal detector. In other words, both features are united in the same dual-purpose physical structure, the subject-matter of claim 1 therefore lacks novelty with respect to documents D1 and D2 (Article 33(2) PCT).

4. The micro-groove detector (MGD) disclosed in document D3 comprises two arrays of microstrips arranged with arbitrary relative orientation on top of each other (cf. figure 1). A voltage potential difference between the layers creates a concentrated electric field in the grooves between them (cf. figure 2) which is high enough to produce sizeable gain. The electron avalanche charge is collected by the strip pattern on the bottom while positive ions flowing back to the top electrodes induce a current of equal size but opposite polarity. Reading out the signals collected on the anodes and cathodes thus provides 2-D positional information (cf. abstract; paragraph '2. The micro-groove detector concept'). A similar detector structure called Macro Gap

Chamber (MGP) is disclosed in document D4 (cf. figure 4; paragraph '5. Conclusions').

Again, the matrix of electric field condensing areas and the signal detector are united in the same dual-purpose physical structure, the subject-matter of claim 1 is therefore not new with regard to documents D3 and D4 either.

5. It is further referred to document D5 which discloses a cathode mesh arranged on top of an array of anode strips with an insulating mechanical joint between them (cf. figure 1; paragraph '2. Detector description'). This microwire detector also combines high amplification and charge collection in one physical structure (cf. paragraphs '1. Introduction' and '3. Detector performance').

6. Dependent claims 2, 3 and 5 define optional features which are already known from documents D3 and D4 (cf. paragraph 4), and mechanical flexibility (cf. claim 13) is obviously a property of all detectors discussed above (Article 33(2) PCT).

7. According to document D5, the cathode grid and the anode strips are spaced by Kapton spacers located at the crossing points of the strips (cf. Fig. 2). Is would be however obvious to apply this structure also to a detector comprising longitudinal cathodes disposed parallel to each other as shown, for instance, in documents D3 and D4 in order to minimize the insulation material between the electrode layers. This optional feature thus lacks inventive step (Article 33(3) PCT).

As regards the particular materials of said spacers (cf. claims 7 and 8) as well as form and material of the electrodes (cf. claims 9 and 12), they are considered as normal design options, in particular as no unexpected effects or properties are presented indicating that these selections might involve an inventive step in the sense of Article 33(3) PCT.

8. None of the cited documents discloses or indicates detector structures such as defined in dependent claim 4 or claims 10 and 11, these embodiments are thus considered as new and inventive in the sense of Article 33(2) and (3) PCT.